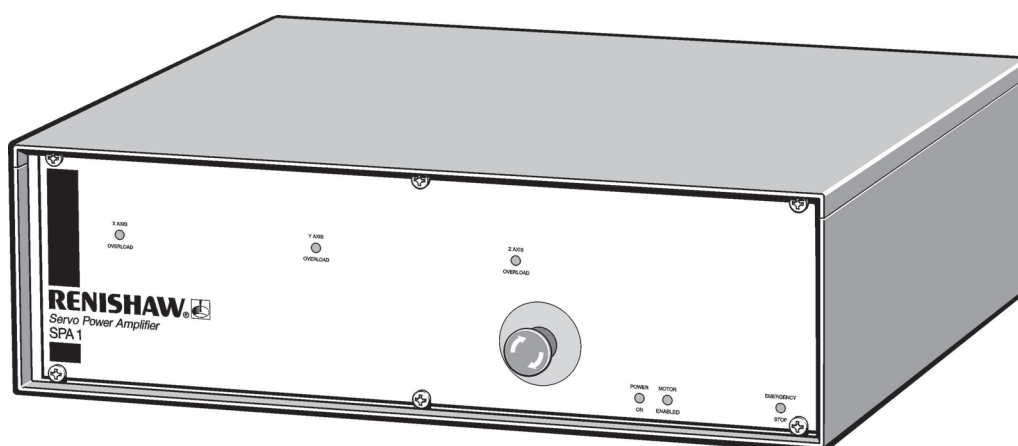


SPA1 servo power amplifier



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Care of equipment

Renishaw probes and associated systems are precision tools used for obtaining precise measurements and must therefore be treated with care.

Changes to Renishaw products

Renishaw reserves the right to improve, change or modify its hardware or software without incurring any obligations to make changes to Renishaw equipment previously sold.

Warranty

Renishaw plc warrants its equipment for a limited period (as set out in our Standard Terms and Conditions of Sale) provided that it is installed exactly as defined in associated Renishaw documentation.

Prior consent must be obtained from Renishaw if non-Renishaw equipment (e.g. interfaces and/or cabling) is to be used or substituted. Failure to comply with this will invalidate the Renishaw warranty.

Claims under warranty must be made from authorised Service Centres only, which may be advised by the supplier or distributor.

References and associated documents

It is recommended that the following documentation is referenced to when installing the SPA1.

Renishaw documents

Documentation supplied on Renishaw UCC1 software CD.

Document No.	Title
H-1000-5056	UCC-1 controller, installation manual
H-1000-5057	UCC-1 controller, programmer's guide
H-1000-5058	RENICIS user's guide
H-1000-5227	Servo tuning guide
H-1000-5067	MCU installation and user's guide

External documents

National and international standards including the following may be applicable to the finished machine or installation:

EN 292-2:1991 (Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles and specifications.

EN (IEC) 60204-1:1997 (Safety of machinery - Electrical equipment of machines - Part 1: General requirements).

Document No.	Title
0470-0005	User guide, Mini Maestro drive

GB**WARNINGS**

The machine manufacturer or the installer of this equipment is responsible for ensuring that the finished machine complies with the necessary safety regulations and standards including those referenced in this handbook.

The user is cautioned that power may be available to the servo drives when the machine is stopped. To ensure that no unexpected movement can occur, the user should activate the Emergency Stop system to remove power before entering the danger zone.

Beware of unexpected movement. The user should remain outside of the full working envelope of probe head / extension / probe combinations.

In all applications involving the use of Machine tools or CMMs, eye protection is recommended.

Disconnect mains before removing covers. Return defective units to an authorised Renishaw customer service centre

For instructions regarding safe cleaning of Renishaw product, refer to MAINTENANCE section of the relevant product documentation.

Refer to the machine supplier's operating instructions

It is the machine supplier's responsibility to ensure that the user is made aware of any hazards involved in operation, including those mentioned in Renishaw product documentation, and to ensure adequate guards and safety interlocks are provided.

Under certain circumstances the probe outputs may falsely indicate the status of the probe. Do not rely on probe signals to stop machine movement.

This equipment is not suitable for use in a potentially explosive atmosphere.

F**AVERTISSEMENTS**

Le fabricant de la machine ou l'installateur de cet équipement est responsable de l'assurance que le produit fini respecte les normes d'installation et de sécurité y compris celles en référence dans ce manuel.

L'utilisateur doit être informé que les amplificateurs de servo commande peuvent rester alimenté lorsque la machine est à l'arrêt. Pour être certain qu'aucun mouvement intempestif ne pourra se produire, il est impératif d'activer le bouton d'arrêt d'urgence pour couper la puissance avant de pénétrer en zone dangereuse.

Attention aux mouvements brusques. L'utilisateur doit toujours rester en dehors de la zone de sécurité des installations multiples Tête de Palpeur/Rallonge/Palpeur.

Le port de lunettes de protection est recommandé pour toute application sur machine-outil et MMC.

Couper l'alimentation secteur avant de retirer les couvercles. Renvoyer toute machine défectueuse à un Centre Après Vente Renishaw agréé.

Les conseils de nettoyage en toute sécurité des produits Renishaw figurent dans la section MAINTENANCE de votre documentation.

Consulter le mode d'emploi du fournisseur de la machine.

Il incombe au fournisseur de la machine d'assurer que l'utilisateur prenne connaissance des dangers d'exploitation, y compris ceux décrits dans la documentation du produit Renishaw, et d'assurer que des protections et verrouillages de sûreté adéquats soient prévus.

Dans certains cas, il est possible que le signal du palpeur indique à tort l'état que le palpeur est au repos. Ne pas se fier aux signaux du palpeur qui ne garantissent pas toujours l'arrêt de la machine.

Cet équipement est impropre à son utilisation en atmosphère explosive.

D**ACHTUNG**

Der Hersteller der Maschine oder derjenige, der dieses Produkt auf der Maschine installiert ist dafür verantwortlich, dass die fertiggestellte Maschine den notwendigen Sicherheitsbestimmungen und Standards, einschließlich derer in diesem Handbuch erwähnten, entspricht.

Der Anwender sei gewarnt, dass auch bei gestoppter Maschine an den Servoantrieben Spannung anliegen kann. Um sicherzustellen, dass keine unerwarteten Verbewegungen auftreten können, sollte der Anwender vor notwendigen Arbeiten in den Gefahrenzonen das Notstop-System aktivieren, um die Stromversorgung zu unterbrechen.

Auf unerwartete Bewegungen achten. Der Anwender soll sich immer außerhalb des Meßtasterkopf-Arm-Meßtaster-Bereichs aufhalten.

Bei der Bedienung von Werkzeugmaschinen oder Koordinatenmeßanlagen ist Augenschutz empfohlen.

Vor dem Abnehmen von Abdeckungen vom Netz trennen. Im Falle von Mängeln sind diese Geräte an Ihren Renishaw Kundendienst zu senden.

Anleitungen über die sichere Reinigung von Renishaw-Produkten sind in Kapitel WARTUNG (MAINTENANCE) in der Produktdokumentation enthalten.

Beziehen Sie sich auf die Wartungsanleitungen des Lieferanten.

Es obliegt dem Maschinenlieferanten, den Anwender über alle Gefahren, die sich aus dem der Ausrüstung, einschließlich der, die in der Renishaw Produktdokumentation erwähnt sind, zu unterrichten und zu versichern, daß ausreichende Sicherheitsvorrichtungen und Verriegelungen eingebaut sind.

Unter gewissen Umständen könnte das Meßtastersignal fälschlicherweise melden, daß der Meßtaster nicht ausgelenkt ist. Verlassen Sie sich nicht allein auf SONDENSIGNALE, um sich über Maschinenbewegungen zu informieren.

Der Verstärker darf nicht in explosiver Atmosphäre verwendet werden.

I**AVVERTENZE**

Il costruttore della macchina o l'installatore di questa apparecchiatura è responsabile di assicurarsi che la macchina, una volta completata, sia conforme alle norme e agli standard di sicurezza necessari, inclusi quelli indicati in questo manuale.

L'utilizzatore è avvisato della possibilità che la macchina, anche se stazionaria, sia alimentata e in potenza. Per assicurarsi che non si verifichino movimenti inaspettati, l'utilizzatore deve attivare il sistema di arresto di emergenza per togliere potenza alla macchina prima di entrare nell'area di lavoro.

Fare attenzione ai movimenti inaspettati. Si raccomanda all'utente di tenersi al di fuori dell'involucro operativo della testina della sonda, prolunghe e altre varianti della sonda.

Si raccomanda di indossare occhiali di protezione in applicazioni che comportano macchine utensili e macchine per misurare a coordinate.

Staccare dalla rete prima di togliere dalle coperture. In caso di guasto, rendere l'apparecchio a uno dei Centri di Assistenza Renishaw.

Per le istruzioni relative alla pulizia dei prodotti Renishaw, fare riferimento alla sezione MANUTENZIONE (MAINTENANCE) della documentazione del prodotto.

Consultare le istruzioni d'uso del fabbricante della macchina.

Il fornitore della macchina ha la responsabilità di avvertire l'utente dei pericoli inerenti al funzionamento della stessa, compresi quelli riportati nelle istruzioni della Renishaw, e di mettere a disposizione i ripari di sicurezza e gli interruttori di esclusione.

E' possibile, in certe situazioni, che la sonda emetta erroneamente un segnale che la sonda è in posizione. Evitare di fare affidamento sugli impulsi trasmessi dalla sonda per arrestare la macchina.

Questo dispositivo non è adatto all'uso in ambienti potenzialmente esplosivi.

E**ADVERTANCIAS**

El fabricante de la máquina o el instalador de este equipo es responsable de asegurarse de que la máquina acabada cumple con las regulaciones de seguridad necesarias y con las normas, incluyendo aquéllas referenciadas en este manual.

El usuario es avisado de que puede haber tensión en los servo accionamientos cuando la máquina está parada. Para asegurarse de que no ocurre un movimiento inesperado, el usuario debería activar el sistema de Paro de Emergencia para quitar la tensión antes de entrar en la zona de peligro.

Tener cuidado con los movimientos inesperados. El usuario debe quedarse fuera del grupo operativo completo compuesto por la cabeza de sonda/extensión/sonda o cualquier combinación de las mismas.

Se recomienda usar protección para los ojos en todas las aplicaciones que implican el uso de máquinas herramientas y máquinas de medición de coordenadas.

Desconectar la alimentación antes de retirar las tapas. Las unidades defectuosas deben ser devueltas a un Centro de Servicio al Cliente Renishaw.

Para instrucciones sobre seguridad a la hora de limpiar los productos Renishaw, remitirse a la sección titulada MANTENIMIENTO (MAINTENANCE) en la documentación sobre el producto.

Remitirse a las instrucciones de manejo del proveedor de la máquina.

Corresponde al proveedor de la máquina asegurar que el usuario esté consciente de cualquier peligro que implica el manejo de la máquina, incluyendo los que se mencionan en la documentación sobre los productos Renishaw y le corresponde también asegurarse de proporcionar dispositivos de protección y dispositivos de bloqueo de seguridad adecuados.

Bajo determinadas circunstancias la señal de la sonda puede indicar erróneamente que la sonda está asentada. No fiarse de las señales de la sonda para parar el movimiento de la máquina.

Este equipo no es adecuado para ser utilizado en una atmósfera potencialmente explosiva.

P**AVISOS**

O fabricante da máquina ou o instalador deste equipamento é responsável em assegurar que quando terminada, a máquina esteja em acordo com os padrões e regulamentos de segurança, incluindo os mencionados neste manual.

O usuário deve ser avisado que os motores podem estar energizados quando a máquina estiver parada. Para assegurar que nenhum movimento ocorra, o usuário deve ativar o sistema de parada de emergência, para desligar a energia, antes de entrar em algum local perigoso.

Tomar cuidado com movimento inesperado. O utilizador deve permanecer fora do perímetro da área de trabalho das combinações Cabeça da Sonda/Extensão/ Sonda.

Em todas as aplicações que envolvam a utilização de Máquinas-Ferramenta e CMMs, recomenda-se usar protecção para os olhos.

Desligar o sector antes de retirar as tampas. Devolver unidades avariadas a um Centro de Atendimento a Clientes Renishaw.

Para instruções relativas à limpeza segura de produtos Renishaw, consultar a secção MANUTENÇÃO (MAINTENANCE) da documentação do produto.

Consultar as instruções de funcionamento do fornecedor da máquina.

É responsabilidade do fornecedor da máquina assegurar que o utilizador é consciencializado de quaisquer perigos envolvidos na operação, incluindo os mencionados na documentação do produto Renishaw e assegurar que são fornecidos resguardos e interbloqueios de segurança adequados.

Em certas circunstâncias, o sinal da sonda pode indicar falsamente uma condição de sonda asentada. Não confiar em sinais da sonda para parar o movimento da máquina.

Este equipamento não é adequado para ser usado em locais com potencial explosivo.

DK**ADVARSLER**

Det er maskinproducentens eller installatøren af dette udstyrs ansvar at sikre, at den færdige maskine overholder alle relevante sikkerhedsregulativer og standarder, indbefattet dem, der henvises til i denne håndbog.

Brugeren gøres opmærksom på, at der kan være strømforsyning til servodrevene, når maskinen er standset. For at sikre mod uventet bevægelse bør brugeren aktivere nødstopssystemet, der afbryder strømforsyningen, før indgang i farezonen.

Pas på uventede bevægelser. Brugeren bør holde sig uden for hele sondehovedets/forlængerens/sondens arbejdsområde.

I alle tilfælde, hvor der anvendes værktøjs- og koordinatmålemaskiner, anbefales det at bære øjenbeskyttelse.

Afbryd ved lysnettet, før dækslerne demonteres. Send alle defekte enheder til Renishaws kundeservicecenter.

Se afsnittet VEDLIGEHOLDELSE (MAINTENANCE) i produktokumentationen for at få instruktioner til sikker rengøring af Renishaw-produkter.

Se maskinleverandørens brugervejledning.

Det er maskinleverandørens ansvar at sikre, at brugeren er bekendt med eventuelle risici i forbindelse med driften, herunder de risici, som er nævnt i Renishaws produktokumentation, og at sikre, at der er tilstrækkelig afskærmning og sikkerhedsblokeringer.

Under visse omstændigheder kan sondesignalet ved en fejl angive, at sonden står stille. Stol ikke på, at sondesignaler stopper maskinens bevægelse.

Dette udstyr er uegnet til brug i en atmosfære med eksplosionsfare.

NL**WAARSUCHSWINGEN**

De machinefabrikant of de installateur van deze apparatuur moet garanderen dat de afgewerkte machine voldoet aan de vereiste veiligheidsvoorschriften en –normen, met inbegrip van deze waarnaar verwezen wordt in dit handboek.

De gebruiker is ervan verwittigd dat drijfkracht naar de servomechanismen aanwezig kan zijn zelfs als de machine stilgelegd wordt. Om onverwachte bewegingen te vermijden, moet de gebruiker het Noodstopstelsel activeren om de drijfkracht uit te schakelen vooraleer zich in de gevarenzone te begeven.

Oppassen voor onverwachte beweging. De gebruiker dient buiten het werkende signaalveld van de Sondekop/Extensie/Sonde combinaties te blijven.

Het dragen van oogbescherming wordt tijdens gebruik van Machinewerktuigen en CMM's aanbevolen.

Netstroom afkoppelen alvorens de beschermkappen af te nemen. U kunt defecte units naar een erkend Renishaw Klantenservice Centrum brengen of toezenden.

Voor het veilig reinigen van Renishaw producten wordt verwezen naar het hoofdstuk ONDERHOUD (MAINTENANCE) in de produktendocumentatie.

De bedieningsinstructies van de machineleverancier raadplegen.

De leverancier van de machine is ervoor verantwoordelijk dat de gebruiker op de hoogte wordt gesteld van de risico's die verbonden zijn aan bediening, waaronder de risico's die vermeld worden in de produktendocumentatie van Renishaw. De leverancier dient er tevens voor te zorgen dat de gebruiker is voorzien van voldoende beveiligingen en veiligheidsgrendelinrichtingen.

Onder bepaalde omstandigheden kan het sondesignaal een onjuiste sondetoestand aangeven. Vertrouw niet op de sondesignalen voor het stoppen van de machinebeweging.

Deze apparatuur is niet geschikt voor gebruik in een potentieel explosieve omgeving.

SW**VARNING**

Antingen maskintillverkaren eller den som installerar denna utrustning ansvarar för att säkerställa att den färdiga maskinen uppfyller tillämpliga säkerhetskrav och –standarder, inklusive dem som nämns i denna handbok.

Användaren måste vara medveten om att ström kan föreligga vid servodrivningarna när maskinen är stoppad. För att eliminera risken för oväntade rörelser ska användaren aktivera nödstoppsystemet, för att koppla bort strömmen, innan arbeten utförs inom riskzonen.

Se upp för plötsliga rörelser. Användaren bör befinna sig utanför arbetsområdet för sondhuvudet/förlängningen/sond-kombinationerna.

Ögonskydd rekommenderas för alla tillämpningar som involverar bruket av maskinverktyg och CMM.

Koppla bort näströmmen innan några kåpor tas bort. Returnera defekta delar till ett auktoriserat Renishaw kundcentra.

För instruktioner angående säker rengöring av Renishaws produkter, se avsnittet UNDERHÅLL (MAINTENANCE) i produktdokumentationen.

Se maskintillverkarens bruksanvisning.

Maskinleverantören ansvarar för att användaren informeras om de risker som drift innebär, inklusive de som nämns i Renishaws produktdokumentation, samt att tillräckligt goda skydd och säkerhetsföreglingar tillhandahålls.

Under vissa omständigheter kan sondens signal falskt ange att en sond är monterad. Lita ej på sondersignaler för att stoppa maskinens rörelse.

Denna utrustning ska inte användas i miljöer där explosionsrisk föreligger.

FIN**VAROITUKSIA**

Koneen valmistaja tai laitteiden asentaja on vastuussa siitä, että valmis kone vastaa kaikkia asiaankuuluvia turvallisuusmääräyksiä ja -säädöksiä mukaan lukien ne, joihin tässä käyttöoppaassa viitataan.

Koneen käyttäjän tulee huomioida, että virta saattaa olla kytketty servokoneistoon, vaikka kone onkin pysähtynyt. Jottei koneisto liikkuisi vahingossa, virta täytyy kytkeä irti hätäpysäytysjärjestelmällä ennen kuin vaara-alueella lähestytään.

Varo äkillistä liikettä. Käyttäjän tulee pysytellä täysin anturin pää/jatkeen/anturin yhdistelmiä suojaavan toimivan kotelon ulkopuolella.

Kaikkia työstökoneita ja koordinoituja mittauskoneita (CMM) käytettäessä suositamme silmäsuojuksia.

Kytke irti virtaverkosta ennen suojusten poistamista. Vialliset osat tulee palauttaa valtuutetulle Renishaw-asiakaspalvelukeskukselle.

Renishaw-tuotteiden turvalliset puhdistusohjeet löytyvät tuoteselosteen HUOLTOA (MAINTENANCE) koskevasta osasta.

Katso koneen toimittajalle tarkoitettuja käyttöohjeita.

Koneen toimittaja on velvollinen selittämään käyttäjälle mahdolliset käyttöön liittyvät vaarat, mukaan lukien Renishaw'n tuoteselosteessa mainitut vaarat. Toimittajan tulee myös varmistaa, että toimitus sisältää riittävän määrän suoja- ja lukkoja.

Tietyissä olosuhteissa anturimerkki saattaa osoittaa virheellisesti, että kyseessä on anturiin liittyvä ongelma. Älä luota anturimerkkeihin koneen liikkeen pysäyttämiseksi.

Näitä laitteita ei saa käyttää räjähdysalttiissa tilassa.

GR

ΠΡΟΕΙΔΟΠΟΙΗΣΕΙΣ

Ο κατασκευαστής της μηχανής ή ο υπεύθυνος εγκατάστασης του εξοπλισμού έχει την ευθύνη να επιβεβαιώσει ότι αφού ολοκληρωθεί η μηχανή, πληροί τα απαραίτητα στάνταρτ και απαιτήσεις ασφαλείας, περιλαμβανομένων και αυτών που αναφέρονται στο παρόν εγχειρίδιο.

Ο χρήστης πρέπει να λάβει υπόψη του ότι μπορεί να υπάρχει ρεύμα στο σερβομηχανισμό όταν η μηχανή είναι σταματημένη. Για να είναι σίγουρο ότι δεν θα συμβεί κάποια απροσδόκητη κίνηση, ο χρήστης πρέπει να ενεργοποιήσει το σύστημα Σταματήματος Έκτακτης Ανάγκης για να διακοπή η παροχή ρεύματος πριν εισέλθει στην επικίνδυνη ζώνη.

Προσοχή - κίνδυνος απροσδόκητων κινήσεων. Οι χρήστες πρέπει να παραμένουν εκτός του χώρου που επηρεάζεται από όλους τους συνδυασμούς λειτουργίας της κεφαλής του ανιχνευτή, της προέκτασης και του ανιχνευτή.

Σε όλες τις εφαρμογές που συνεπάγονται τη χρήση εργαλείων μηχανημάτων και εξαρτημάτων CMM, συνιστάται η χρήση συσκευής προστασίας των ματιών.

Απομονώστε τη συσκευή από το δίκτυο προτού αφαιρέσετε τα προστατευτικά καλύμματα. Επιστρέψτε τις ελαττωματικές συσκευές σε εξουσιοδοτημένο Κέντρο Εξυπηρέτησης Πελατών της Renishaw.

Για οδηγίες που αφορούν τον ασφαλή καθαρισμό των προϊόντων Renishaw, βλέπετε το κεφάλαιο MAINTENANCE (ΣΥΝΤΗΡΗΣΗ) στο διαφωτιστικό υλικό του προϊόντος.

Βλέπετε τις οδηγίες λειτουργίας του προμηθευτή του μηχανήματος.

Αποτελεί ευθύνη του προμηθευτή του μηχανήματος να εξασφαλίσει ότι ο χρήστης είναι ενήμερος τυχόν κινδύνων που συνεπάγεται η λειτουργία, συμπεριλαμβανομένων και όσων αναφέρονται στο διαφωτιστικό υλικό του προϊόντος της Renishaw. Είναι επίσης ευθύνη του να εξασφαλίσει ότι υπάρχουν τα απαιτούμενα προστατευτικά καλύμματα και συνδέσεις ασφαλείας.

Υπό ορισμένες συνθήκες μπορεί το σήμα ανιχνευτή να δώσει εσφαλμένη ένδειξη θέσης του ανιχνευτή. Μη βασίζεστε στα σήματα ανιχνευτή για θέση της κίνησης του μηχανήματος εκτός λειτουργίας.

Προσοχή – Η συσκευή αυτή δεν πρέπει να χρησιμοποιείται σε περιβάλλον με δυναμικά εκρηκτική ατμόσφαιρα.

FCC

Information to user (FCC section 15.105)

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the installation manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your expense.

Information to user (FCC section 15.21)

The user is cautioned that any changes or modifications not expressly approved by Renishaw PLC or authorised representative could void the user's authority to operate the equipment.



The SPA1 has been manufactured in conformity with the following standards:

BS EN 61326:1998 Electrical equipment for measurement, control and laboratory use – EMC requirements.

Immunity to Annex A - industrial locations.

Emissions to class A (non-domestic) limits.

BS EN 60204-1:1998 Safety of machinery – Electrical equipment of machines – Part 1: General requirements.

and that it complies with the requirements of the following EC Directives (as amended):

- | | | |
|------------|---|-------------------------------------|
| 89/336/EEC | – | Electromagnetic compatibility (EMC) |
| 73/23/EEC | – | Low voltage |

Safety

Electrical requirements

The SPA1 is powered from the a.c. mains supply via an IEC 320 connector. The operating voltages of the unit are as follows :

85 – 264 V ac 47 – 66 Hz 600 W maximum

This equipment must be connected to a protective earth conductor via a three core mains (line) cable. The mains plug shall be inserted only into a socket outlet provided with a protective earth contact. The protective earth contact shall not be negated by the use of an extension cable without protective conductor.

An earth stud is provided to allow bonding of the CMM metal parts to the protective earth

WARNINGS : Any interruption of the protective conductor may make the equipment dangerous. Make sure that the grounding requirements are strictly observed.

Environmental requirements

The following environmental conditions comply with (or exceed) BS EN 61010-1:1993

Indoor use	IP30 (no protection against water)*
Altitude	up to 2000 m
Operating temperature	0 °C to +50 °C (local to SPA1)
Storage temperature	-10°C to +70°C
Relative humidity	80% maximum (non-condensing) for temperatures up to +31 °C. Linear decrease to 50% at +40 °C
Transient overvoltages	Installation category II
Pollution degree	2

NOTE : If a higher IP rating is required following a risk assessment by the installer of the equipment an additional external enclosure will be required to house the SPA1.

Revision history

Issue 01-A

- First issue – Beta release

Issue 02-A

- Production release of unit
- Inclusion of 24 V motor supply option

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1.0 System description

The servo power amplifier (SPA1) unit is a 3-axis variable speed drive for permanent magnet DC servo motors, designed for use with the Renishaw universal CMM controller (UCC1).

The unit contains three proprietary servo power amplifiers, contactor circuitry and a power supply.

1.1 SPA1 kit components

Each SPA1 kit (part number A-1333-0008) contains the following components:

1.1.1 Servo power amplifier unit

This unit contains contactor circuitry and a power supply to enable the movement of a system, the capability of the SPA1 unit is :

- 336 W continuous
- 480 W peak per channel
- 480 W maximum total power

1.1.2 Connection cables

Three connection cables are supplied with the SPA1 system. These cables are as listed below

- MCU (joystick) daughter card ESTOP connector to UCC1 Comms CH1 connector for the Emergency Stop signal.
- SPA1 "SPA" connector to UCC1 "Servo Power Amplifier" connector.
- SPA1 "machine I/O" connector to UCC1 "Machine I/O" connector, incorporating an additional connector for interconnection of other system signals.

1.1.3 SPA drives

- 3 off propriety SPA drives are supplied.
- The drives are supplied by Control Techniques™ and are the "Mini Maestro™" DCDx7/14 model.

1.2 SPA1 accessories

1.2.1 Service pack

The service pack (part number A-1333-0017) contains the following components that will assist in the connection of the SPA1 to CMM installation.

- 3 off Motor connectors including backshells.
- 6 off Power pins for motor connectors (7W2).
- 4 off dil headers.
- 4 off 20 K multi-turn potentiometers.
- 300 mm length of wire.
- 1 off 37-way D connector including backshell for machine I/O connection.
- 1 off 9-way D connector including backshell for Emergency Stop connection.

1.2.2 Replacement SPA drives

If required replacement SPA drives (part number P-MC10-0001) can be ordered from Renishaw for support purposes.

1.3 SPA1 system layout

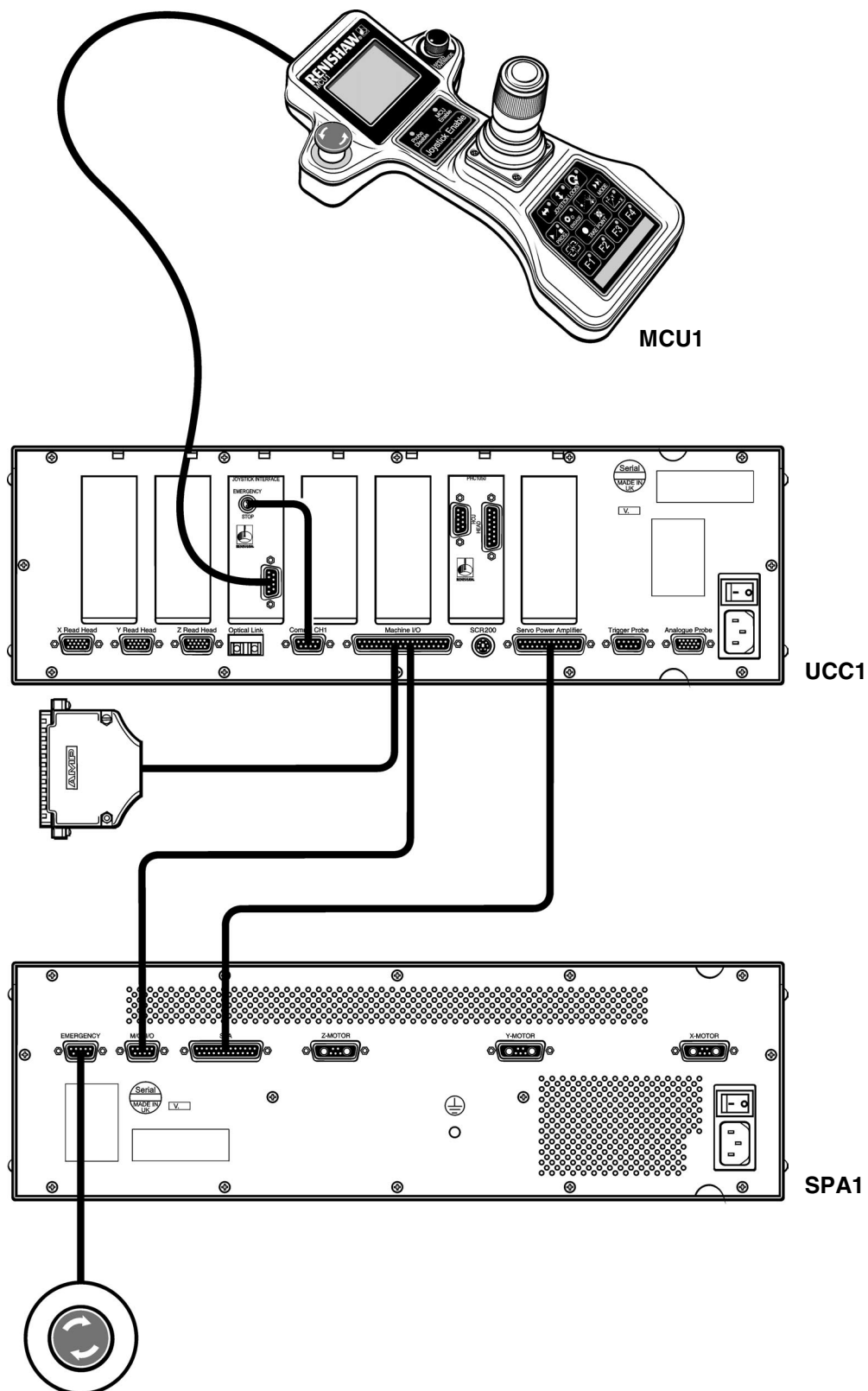


Figure 1 – Simplified SPA1 system layout

2.0 Front panel description

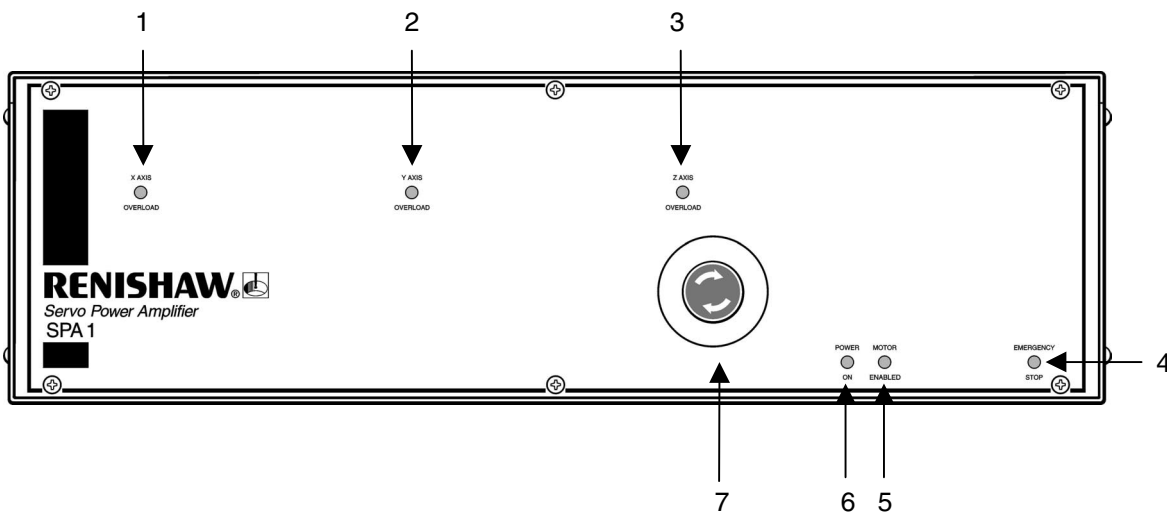


Figure 2 - Front panel of the SPA1.

Key

- 1 – X axis overload indicator (refer to section 2.1)
- 2 – Y axis overload indicator (refer to section 2.1)
- 3 – Z axis overload indicator (refer to section 2.1)
- 4 – Emergency stop indicator (refer to section 2.2)
- 5 – Motor enabled indicator (refer to section 2.3)
- 6 – Power indicator (refer to section 2.4)
- 7 – Emergency Stop button (refer to section 2.5)

2.1 Axis overload

There are a number of possible causes for this LED to become lit, please refer to the Control Techniques™, “Mini Maestro™” User guide supplied with the product.

2.2 Emergency stop LED

This LED is lit when the SPA1 is aware of an Emergency Stop being applied to the system. During normal operation this LED is extinguished.

2.3 Motor enabled

This LED is lit when the SPA1 servo amps are engaged.

2.4 Power

This LED is lit when there is a mains supply attached to the SPA1 unit.

2.5 Emergency stop button

A normal category ‘0’ emergency stop function is provided within this unit. It is the machine installers responsibility to add any additional emergency stop switches that the system requires.

3.0 Rear panel description

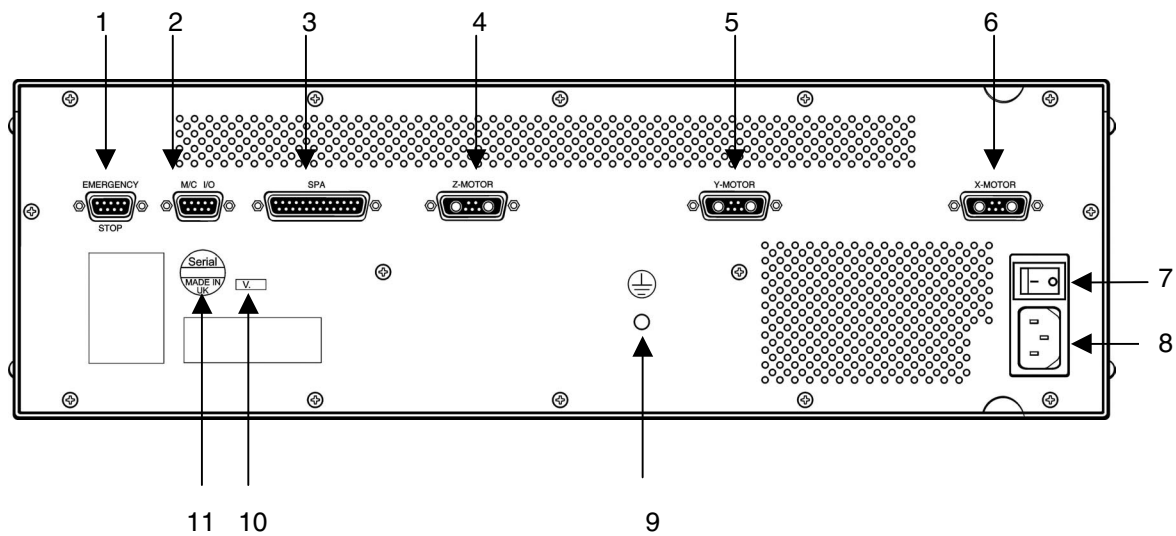


Figure 3 - Rear panel of the SPA1.

Key

1. Emergency stop connector (refer to section 3.1)
2. Machine I/O connector (refer to section 3.2)
3. SPA connector (refer to section 3.3)
4. Z motor connector (refer to section 3.4)
5. Y motor connector (refer to section 3.4)
6. X motor connector (refer to section 3.4)
7. Mains power ON/OFF switch
8. Main power input via an IEC320 connector
9. Earth stud
10. Version number label
11. Serial number label

3.1 Emergency stop connector

3.1.1 Connector

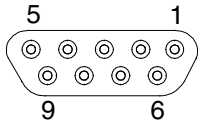


Figure 4 - ESTOP connector (View on face of socket rear of plug)

3.1.2 Pin outs

Pin No.	Description
1	Not connected
2	Not connected
3	Not connected
4	Not connected
5	Not connected
6	ESTOP_A
7	ESTOP_B
8	Not connected
9	Not connected
Shell	Gnd

3.2 Machine I/O connector

3.2.1 Connector

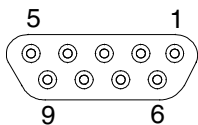


Figure 5 - Machine I/O connector (View on face of socket, rear of plug)

3.2.2 Pin outs

Pin number	Function
1	Amplifier OK output
2	Not connected
3	Emergency stop output
4	Not connected
5	Motor contactor feedback output
6	Not connected
7	Not connected
8	Not connected
9	Not connected
Shell	Shell and screen

3.3 Servo power amplifier connector

3.3.1 Connector

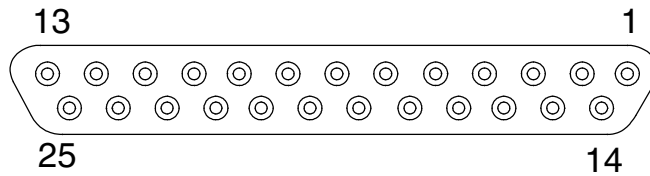


Figure 6 – Servo power amplifier connector (View on face of socket, rear of plug)

3.3.2 Pin outs

Pin number	Function	Description
1	+24 Vdc	Provided for use on CMM status switches.
2	Contacteur	Input signal to control motor contactor
3	Not connected	
4	Amp Control C	Floating collector (Amplifier enabling)
5	Amp Control E	Floating emitter (Amplifier enabling)
6	ESTOP_A	
7	ESTOP_B	
8	- Z command	Differential input to CMM Z drive motor
9	+ Z command	Differential input to CMM Z drive motor
10	- Y command	Differential input to CMM Y drive motor
11	+ Y command	Differential input to CMM Y drive motor
12	- X command	Differential input to CMM X drive motor
13	+ X command	Differential input to CMM X drive motor
14	Not connected	
15	Not connected	
16	Command common	Ref. line for power amplifier commands
17	Not connected	
18	Not connected	
19	Not connected	
20	Not connected	
21	Not connected	
22	Mot cont F/B	Motor contactor feedback output
23	Servo amps OK	Amplifier OK output
24	ESTOP tripped	
25	24 V return	Common for dc supply and contactor signal
Shell	Shell and screen	

3.4 Motor connector

3.4.1 Connector

On the rear of the SPA1 unit there are three motor connection channels (X,Y and Z) the function of:

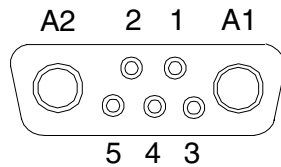


Figure 7 – Motor connection (View on face of socket, rear of plug)

3.4.2 Pin outs

Pin number	Description
A1	+ Motor output
A2	- Motor output
1	+ Tachogenerator input
2	- Tachogenerator input
3	Not connected
4 (linked to pin 2)	- Tachogenerator input
5	Not connected
Shell	Shell and screen

4.0 Installing the SPA1

4.1 Preparation of SPA1 service pack

When the SPA1 service pack is received it contains all the components required to construct the following items. These items will assist in the connection and set-up of the SPA1 unit.

4.1.1 Motor connectors

The service pack contains three motor connectors that fit the motor output from the SPA1.

Each of the three connector assemblies consist of the following:

- 1 off metal backshell
- 1 off power and signal D-type connector
- 2 off power pins

The power and signal D-type and power pins are all of the solder bucket variety and should be fitted to the CMM wiring by a competent technician or engineer.

4.1.2 20 K potentiometer on dil header

The 20 K potentiometer on dil header must be constructed for use (if required) as detailed in section 4.5.1 step 12.

To fit a 20 K potentiometer on dil header the following procedure is recommended.

- Place the dil header on a firm surface.
- Solder two of the potentiometer legs (centre and one side) to one side of the dil header, and the other leg to the other side, refer to figure 8 below.

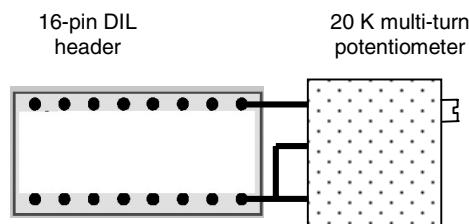


Figure 8 - 20 K potentiometer on dil header

4.1.3 20 K potentiometer on 150 mm wire

The 20 K potentiometer on 150 mm wire must be constructed for use (if required) as detailed in section 4.5.1 step 3 onwards.

To construct the 20 K potentiometer on 150 mm wire the following procedure is recommended.

- Take the wire supplied in the SPA1 service pack and cut it in half.
- Solder one of the wires to two of the potentiometers legs (centre and one side).
- Solder the second wire to the other potentiometers leg.
- Solder either of the wires, with the potentiometer fitted to the other end, to pin 1 on the dil header, refer to figure 9 below.
- Solder the other wire, with the potentiometer fitted to the other end, to pin 16 on the dil header, refer to figure 9 below.

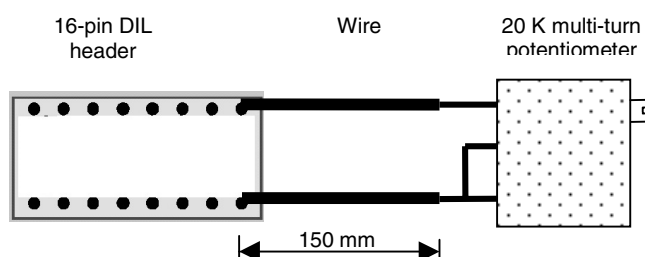


Figure 9 - 20K potentiometer on 150mm wire

4.1.4 Emergency stop

The service pack contains a 9-way D connector and backshell which fits the Emergency stop connector from the SPA1.

This connector is of the solder bucket variety and should be fitted to the CMM wiring by a competent technician or engineer.

4.1.5 Machine I/O connector

The service pack contains a 37-way D connector and backshell which connects to the cable linking the UCC1 machine I/O connector and the SPA1 machine I/O connector.

This connector is of the solder bucket variety and should be fitted to the CMM wiring by a competent technician or engineer.

4.2 Setting of the motor voltage

The SPA1 has the ability to drive either 24 V or 48 V motors, the factory settings for the unit is the 48 V configuration.

The following procedure gives instructions to change the configuration of the SPA1 to permit a 24 V motor voltage.

CAUTION

- It is essential that full anti-static precautions be taken before working within the SPA1 enclosure.
 - Before the SPA1 is opened up mains power to the SPA1 must be switched off.
 - The heat sink on the SPA drives could be warm to touch.
 - It is essential that full anti-static precautions be taken before working within the SPA1 enclosure.
 - The SPA1 unit contains components that store energy. After power has been removed the installation engineer should wait a minimum of 30 seconds prior to working within the SPA1 enclosure.
-

1. Remove AC supply from SPA1 and disconnect other system cables to CMM.
2. Remove top panel of the SPA1 enclosure; ensure that all fixing screws are retained for future re-assembly.

This is completed by removal of a screw from each side of the SPA1 unit towards the front of the enclosure, and removal of the 5 screws across the top of the rear panel of the SPA1. Then the top of the SPA1 can be removed by pulling upward on the lid of the unit.

3. Locate the motor voltage configuration as shown in figure 10.

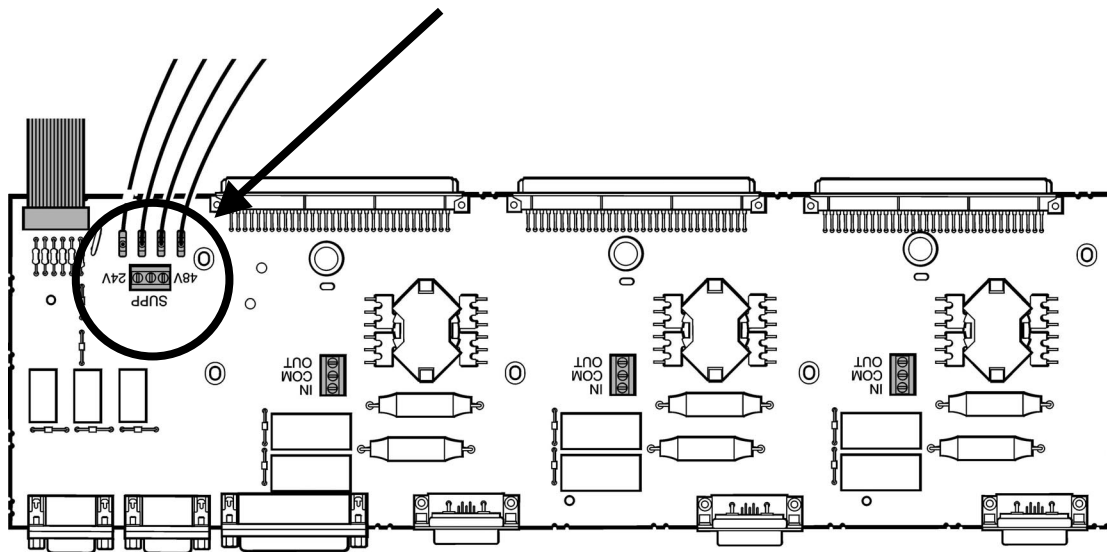


Figure 10 – Motor voltage configuration

4. Changing the motor voltage is achieved by positioning the link wire that is joining the “SUPP” terminal (supply to PCB) to the “48V” terminal, such that the link wire now joins the “SUPP” and the “24V” terminals. Refer to figure 11.

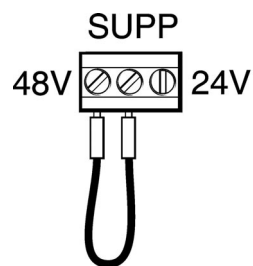


Figure 11 – Identification of the motor voltage configuration terminal

NOTE:

- Do not overtighten the connector when changing the wire connection within the SPA1 unit.
- Ensure the screw within the third terminal is tightened.

5. When the motor voltage has been altered then the top panel of the unit must be re-fitted, this is completed by reversal of the method used in step 2.

4.3 Accessing SPA drives

The recommended procedure for accessing the SPA drives located within the SPA1 unit is as detailed below.

1. Remove the front panel of the SPA1 by releasing the 6 fixing screws that restrain the front panel as shown in figure 12.

WARNING: Sharp edges will be exposed when removing the front panel of the SPA1, as the EMC connection strip behind the panel has a serrated edge.

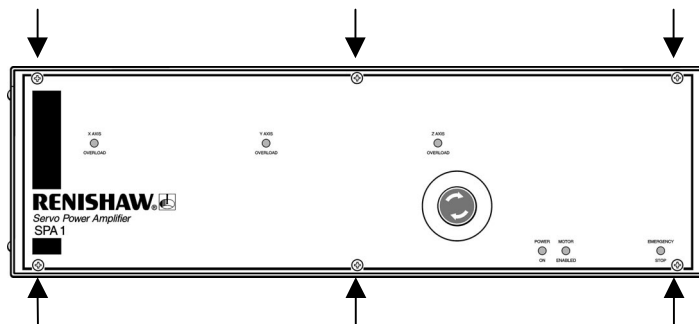


Figure 12 – Front of SPA unit showing screws

CAUTION: Anti-static precautions should be used when handling the SPA drives.

3. Adjust the drives in accordance to section 4.4.
4. Re-fit the SPA1 front panel and secure it using the 6 fixing screws.

4.4 Functions of the SPA drive potentiometers

The SPA drives have 5 potentiometers located at the front of the SPA1 when fitted. The functions of the are as detailed below – please refer to figure 13.

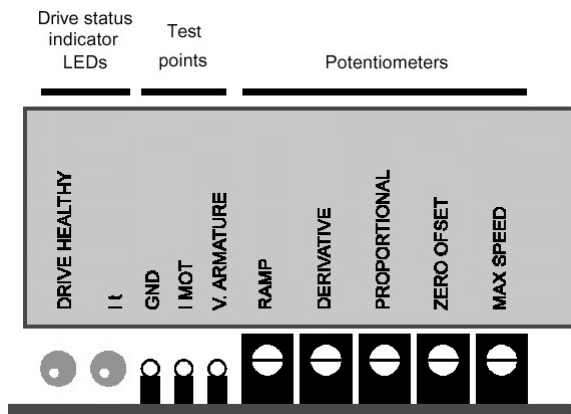


Fig 13 - Locations of potentiometers on the drive

4.4.1 Ramp

Adjust the potentiometer to increase or decrease the time from 0 second to 2 seconds for the motor to reach maximum speed (with a 10 V speed reference signal). To disable ramps set the potentiometer at the fully anti-clockwise position (this should be the initial starting point position).

4.4.2 Derivative

Turn the potentiometer clockwise to reduce the amount of overshoot in the system response by increasing the derivative gain of the PID amplifier.

4.4.3 Proportional

Turn the potentiometer clockwise to increase the proportional gain of the PID amplifier.

4.4.4 Zero offset

Adjust this potentiometer to cancel any offset in the external speed reference signal.

4.4.5 Max speed

Turn the potentiometer anti-clockwise to reduce the maximum motor speed to 50%. Turn the potentiometer clockwise to increase the maximum motor speed to 120%.

4.5 Adjusting the SPA drives

Please refer to the Renicis UCC1 controller installation program User's guide (H-1000-5058), chapter 6 for the procedure on how to set up the SPA drives.

The Mini Maestro drive offers the ability to adjust various parameters such as peak current, motor internal resistance compensation and armature voltage speed feedback.

Most applications do not require these parameters to be adjusted. However, if adjustment is required please refer to the Mini Maestro User guide (0470-0005, included with each SPA drive) for guidance.

4.5.1 Max speed adjustment

When using the Mini Maestro SPA drives and the SPA1 it has been experienced that it is not always possible to achieve the desired maximum move speed by adjustment of the 'MAX SPEED' potentiometer on the drive.

If this is the case the 'RT' resistor on SK1 on the SPA drive will require adjustment (default value = 10K0). This resistor normalises the tachogenerator input signal and adapts the drive to the voltage constant of the tachogenerator.

If adjustment to the 'RT' resistor is required then the following procedure is recommended.

CAUTION:

- Before the drive is removed from its guide way, mains power to the SPA1 must be switched off.
 - The heat sink on the drive could be warm to touch.
 - Anti-static precautions should be used when handling the SPA drives.
-

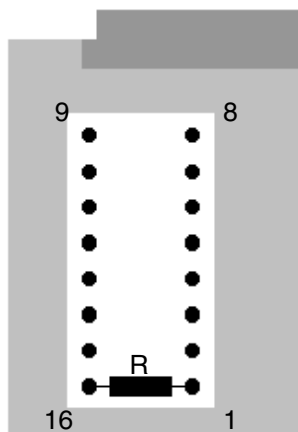


Fig 14 - Location of RT on the drive

NOTE:

- This procedure assumes that you have prepared and will be using the SPA1 service pack. (refer to section 4.1).
 - If more than one axis requires adjustment then this procedure should be repeated for each axis in turn.
-

1. Remove the SPA drive requiring adjustment from the SPA1 by sliding out the drive from the front of the enclosure.
2. Remove the dil header fitted to SK1 of the SPA drive that has the 10 K resistor fitted.
3. Set the value of the 20K multiturn potentiometer on 150 mm wire connected to a dil header (contained in the service pack refer to section 4.1) to 10 K.
4. Fit the 20 K multiturn potentiometer on 150 mm wire connected to a dil header into SK1.
5. Refit the SPA drive into the SPA1 feeding the wire with the 20 K multiturn potentiometer so that the potentiometer is at the front of the SPA drive when fitted.
6. Adjust the 'MAX SPEED' potentiometer fully anti-clockwise until the end stop click is heard then adjust the potentiometer 9 turns clockwise (centre position).
7. Follow the 'Setting the power amplifier velocity gain' step of the Renicis UCC1 controller installation program (User's guide H-1000-5058, chapter 6) adjust the target speed to the 25 mm/s using the Tachogenerator potentiometer.
8. Disengage the servos in RENICIS and switch off the mains power to SPA1.
9. Remove the SPA drive from the SPA1 by sliding out the drive from the front of the enclosure.
10. Remove the dil header fitted to SK1.
11. Measure the value of the potentiometer fitted to the dil header with a resistance meter. This now determines the required value of the RT resistor.
12. Set the value of one of the 20 K multiturn fitted directly to a dil header (contained in the service pack refer to section 4.4) to the measured value of 'RT' (from step 11) and fit into SK1 of the SPA drive, refer to fig 14.
13. Re-fit the SPA drive into the SPA1.

NOTE:

- It is recommended that a fixed resistor of the nearest preferred value should be fitted to a dil header and used as 'RT' if possible.
 - It is not recommended to retain the potentiometer extended on the wire as this is likely to introduce electrical interference into the tachogenerator circuitry.
-

14. The 'Calc Velocity Gain' step can be run though again in RENICIS and any adjustment required made using the 'MAX SPEED' potentiometer.

4.6 Adjustment of the inductance of the motor drive system

When using the Mini Maestro drives it is necessary, when a motor has an inductance of less than 1mH, to have an inductor connected between the motor and the drive. The SPA1 has a 10 mH inductor fitted to the system as default. This can be removed if not required.

If the inductance of the SPA1 and motor combination is too high then the CMM will tend to overshoot when positioning. If this happens remove the inductance by following steps 1 to 6 below.

If the inductance of the SPA1 and motor combination is too low the drive will oscillate and an audible whistle will be heard. If this happens reinstate the inductance by following steps 1 to 6 below but connect the link between IN and COM in step 4.

WARNINGS:

- It is essential that full anti-static precautions be taken before working within the SPA1 enclosure.
- The SPA1 unit contains components that store energy. After power has been removed the installation engineer should wait a minimum of 30 seconds prior to working within the SPA1 enclosure.

1. Remove AC supply from SPA1 and disconnect other system cables to CMM.
2. Remove top panel of the SPA1 enclosure; ensure that all fixing screws are retained for future re-assembly.

This is completed by removal of a screw from each side of the SPA1 unit towards the front of the enclosure, and removal of the 5 screws across the top of the rear panel of the SPA1. Then the top of the SPA1 can be removed by pulling upward on the lid of the unit.

3. Identify the axis channel that requires the inductor to be removed from the drive system, these are shown in figure 15.

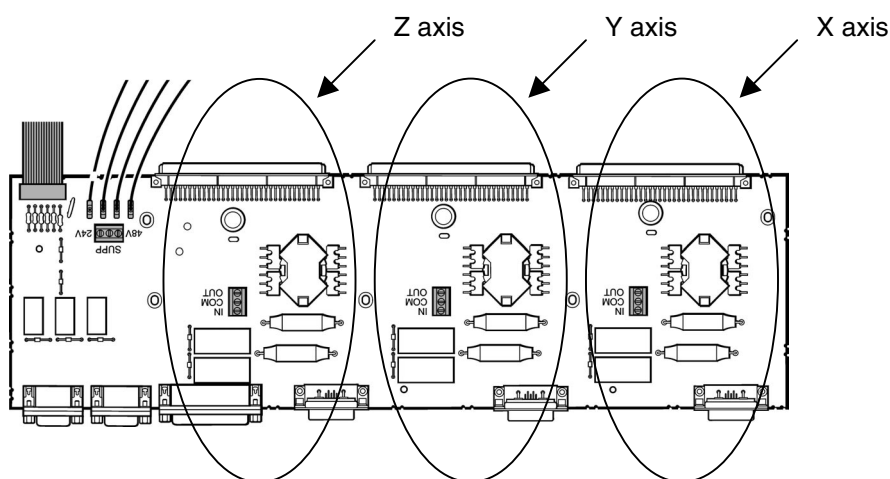


Figure 15 - SPA1 with top of enclosure removed

4. Removal of the inductor from the drive system is achieved by changing the link wire that is joining the “COM” (common) to the “IN” (inductor in circuit) terminals, such that the link wire now joins the “COM” and the “OUT” (inductor out of circuit) terminal. Refer to figure 16.

The inductor configuration terminal is located at towards the rear panel on the SPA1 in the respective axis area as shown in figure 15.

NOTE:

- Do not overtighten the connector when changing the wire connection within the SPA1 unit.
 - Ensure the screw within the third terminal is tightened.
-

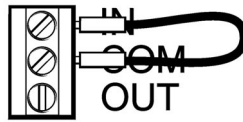


Figure 16 – Identification of the inductor configuration terminal

Key

IN	= Inductor in circuit
COM	= Common connection
OUT	= Inductor out of circuit

5. When the respective axis channel has been modified then the top panel of the unit must be re-fitted, this is completed by reversal of the method used in step 2.
6. Re-connect the system cables that were removed from the CMM, then reapply the AC supply to the SPA1.

5.0 System interconnection diagrams

Many problems can be solved by examination of the system configuration and current conditions. In addition, the RENICIS program provides several functions to assist in SPA1 problem solving and commissioning.

5.1 Cable connections

5.1.1 Emergency stop cable

This cable is designed to connect the E.STOP circuit between the Joystick daughter card emergency stop connector and the UCC1 comms channel 1 connector.

The cable configuration for this cable is as specified below.

UCC1 comms 9-way D connector	Function	Joystick daughter card Mini lemo connector
6	ESTOP-A	C
7	ESTOP-B	NOT C
Shell	Screen	Shell

5.1.2 SPA cable

This cable is designed to connect all the necessary signals from the SPA1 to the UCC1 units.

The cable configuration for this cable is as specified below.

SPA1 pin number	Function	UCC1 pin number
1	+24 Vdc	1
2	Contactor	2
3	Not connected	3
4	Amp Control C	4
5	Amp Control E	5
6	ESTOP_A	6
7	ESTOP_B	7
8	- X command	12
9	+ X command	13
10	- Y command	10
11	+ Y command	11
12	- Z command	8
13	+ Z command	9
14	- W command	14
15	+ W command	15
16	Command common	16
17	<i>Reserved</i>	17
18	<i>Reserved</i>	18
19	<i>Reserved</i>	19
20	<i>Reserved</i>	20
21	<i>Reserved</i>	21
22	<i>Reserved</i>	22
23	<i>Reserved</i>	23
24	<i>Reserved</i>	24
25	24 V return	25
Shell	Screen	Shell

5.1.3 Machine I/O cable

This cable is designed to connect some functions from the machine I/O connector from the UCC1 to the machine I/O connector on the SPA1, also giving the ability to attach external connections to the system through the additional connector.

The cable configuration is as specified below.

UCC1 machine I/O connector pin number	Function	SPA1 machine I/O connector pin number	Additional machine I/O connector pin number
1	+24 Vdc	-	1
2	<i>Reserved</i>	-	2
3	<i>Reserved</i>	-	3
4	<i>Reserved</i>	-	4
5	<i>Reserved</i>	-	5
6	Output 0	-	6
7	Output 1	-	7
8	Output 2	-	8
9	Output 3	-	9
10	Output 4	-	10
11	Output 5	-	11
12	Output 6	-	12
13	Input 0	-	13
14	Input 1	-	14
15	Input 2	-	15
16	Input 3	-	16
17	Input 4	-	17
18	Input 5	-	18
19	Input 6	1	-
20	Input 7	-	20
21	Emergency Stop	-	21
22	Air pressure	-	22
23	Crash	3	-
24	Contactors feedback	5	-
25	X+ outer limit	-	25
26	X- outer limit	-	26
27	Y+ outer limit	-	27
28	Y- outer limit	-	28
29	Z+ outer limit	-	29
30	Z- outer limit	-	30
31	X+ inner limit	-	31
32	X- inner limit	-	32
33	Y+ inner limit	-	33
34	Y- inner limit	-	34
35	Z+ inner limit	-	35
36	Z- inner limit	-	36
37	24V return	-	37
Shell	Shell and screen	Shell	Shell

6.0 Maintenance

Periodically check the security of mounting screws and electrical connectors.

Periodical electrical safety checks should include inspection of the mains cable for damage and safe connections. An earth continuity (ground bonding) test may be applied between the protective earth pin of the mains connector and the metal case at a test current of no greater than 25 A.

Periodical safety checks should include the function of the Emergency Stop system, this must include operation of all switches integrated into the system. After operation of the Emergency Stop system the SPA1 should be checked to ensure servo power can then be engaged.

Remove dust from the external surfaces with a clean dry cloth, the unit is not sealed against fluids/water.

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